查询LTC221CJ供应商

Micropower, Low Charge Injection, Quad CMOS Analog Switches with Data Latches

FEATURES

- Micropower Operation
- Single 5V or ±15V Supply Operation
- Low Charge Injection
- Low R_{ON}
- Low Leakage
- Guaranteed Break Before Make
- Latch Resistant Design
- TLL/CMOS Compatible
- Improved Second Source for DG221/DG222
- Microprocessor Bus Compatible

KEY SPECIFICATIONS

- Supply Current ..... I^+ = 40μA, I^- = 5μA Max
- Charge Injection
  - ±15V Supplies ..... ±25pC Max
  - Single 5V Supply ..... 2pC Typ
- R_{ON} 65ΩTyp
- Signal Range ..... ±15V

DESCRIPTION

The LTC®221 and LTC222 are micropower, quad CMOS analog switches which typically dissipate only 250μW from ±15V supplies and 40μW from a single 5V supply. Onboard latches allow the LTC221 and LTC222 to interface directly to most microprocessor buses. The switches have 65Ω typical on resistance and a very high off resistance. A break before make characteristic is inherent in these switches to prevent the shorting of two channels. The signal range is ±15V with a supply voltage of ±15V and 0V to 5V with a single 5V supply. The switches have special charge compensation circuitry which greatly reduces charge injection to a maximum of ±25pC (±15V supplies).

The LTC221 and LTC222 are designed for applications such as microprocessor controlled programmable gain amplifiers, automatic test equipment, communication systems, and data acquisition systems. The LTC221 is normally closed and the LTC222 is normally open as shown in the Logic Table.

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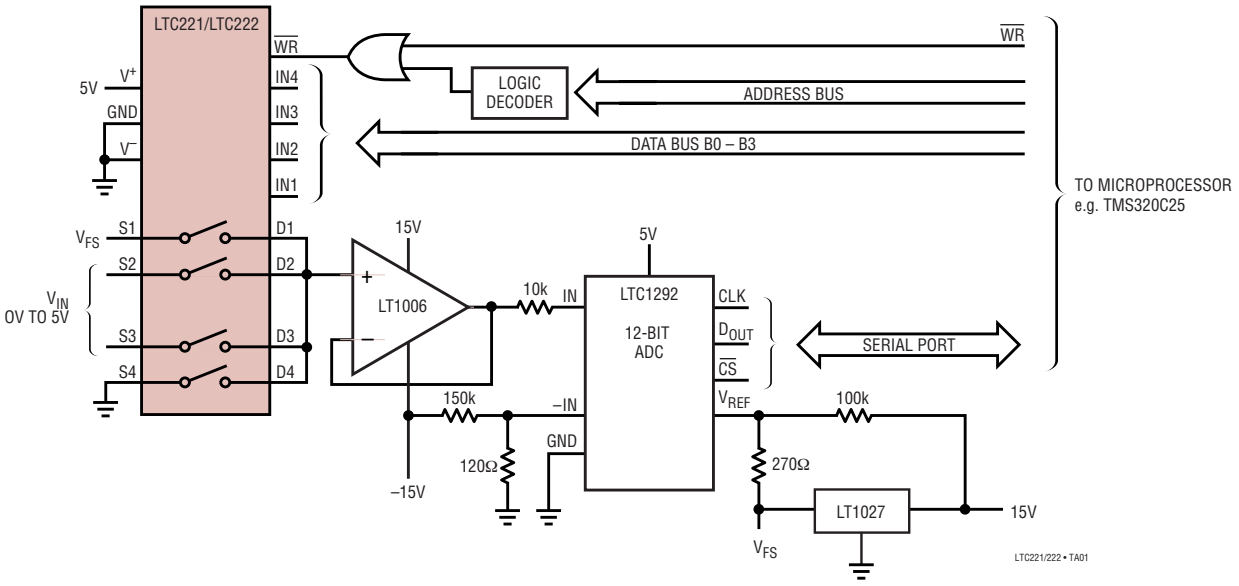
TYPICAL APPLICATION

Two-Channel, 12-Bit, Self Calibrating Data Acquisition System



ABSOLUTE MAXIMUM RATINGS

(Note 1)

Voltages Referenced to V^-

V^+ 44V

GND 25V

Digital Inputs, S, D (Note 2) ..... –2V to (V^+ 2V) or 20mA, Whichever Occurs First

Current

Any Input Except S or D 30mA

Continuous S or D 20mA

Peak S or D

(Pulsed at 1 ms, 10% Duty Cycle Max) 70mA

ESD Susceptibility (Note 3) 4kV

Power Dissipation (Plastic) 500mW

Power Dissipation (Ceramic) 900mW

Operating Temperature Range

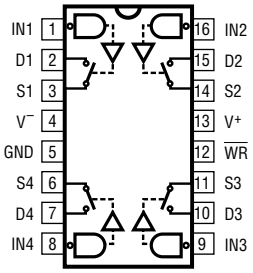
LTC221C/LTC222C ..... 0°C to 70°C

LTC221M/LTC222M **(OBSOLETE)**.....–55°C to 125°C

Storage Temperature Range ..... –65°C to 150°C

Lead Temperature (Soldering, 10 sec)..... 300°C

PACKAGE/ORDER INFORMATION



N PACKAGE
16-LEAD PDIP
J_{MAX} = 110°C, θ_{JA} = 120°C/W

S PACKAGE
16-LEAD PLASTIC SO
J_{MAX} = 110°C, θ_{JA} = 130°C/W

J PACKAGE
16-LEAD CERDIP

OBSOLETE PACKAGE
Consider the N or S Package for Alternate Source

ORDER PART NUMBER
LTC221CN
LTC221CS
LTC222CN
LTC222CS
LTC221MJ
LTC221CJ
LTC222MJ
LTC222CJ

Consult LTC Marketing for parts specified with wider operating temperature ranges.

LOGIC TABLE

INX	$\overline{WR}$	LTC221	LTC222
0	0	On	Off
1	0	Off	On
X	1	Maintain Previous State	Maintain Previous State

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range, otherwise specifications are at T_A = 25°C. V^+ = ±15V, V^- = –15V, GND = 0V, unless noted.

PARAMETER	CONDITIONS			LTC221M/LTC222M MIN	LTC221M/LTC222M TYP	LTC221M/LTC222M MAX	LTC221C/LTC222C MIN	LTC221C/LTC222C TYP	LTC221C/LTC222C MAX	UNITS
Analog Signal Range			●			±15			±15	V
R_{ON}	V_S = ±10V, I_D = 1mA	T_{MIN}				90			90	Ω
		25°C			65	90		65	90	Ω
		T_{MAX}				135			135	Ω
Off Input Leakage I_S (OFF)	V_D = 14V, V_S = ±14V				0.01	±1		0.01	±5	nA
			●			±100			±100	nA
Off Output Leakage I_D (OFF)	V_{IN} = 2.4V, LTC221				0.01	±1		0.01	±5	nA
	V_{IN} = 0.8V, LTC222		●			±100			±100	nA
On Channel Leakage I_D (ON)	V_D = V_S = ±14V, V_{IN} = 2.4V, LTC222				0.02	±1		0.02	±5	nA
	V_{IN} = 0.8V, LTC221		●			±200			±200	nA
Input High Voltage V_{INH}, $V_{\overline{WR}H}$			●	2.4			2.4			V
Input Low Voltage V_{INL}, $V_{\overline{WR}L}$			●			0.8			0.8	V
Input High or Low Current I_{INH}, I_{INL}, $I_{\overline{WR}H}$, $I_{\overline{WR}L}$	V_{IN} = 15V, 0V; $V_{\overline{WR}}$ = 15V, 0V		●			±1			±1	µA
C_S (OFF)					5			5		pF
C_D (OFF)					12			12		pF
C_D, C_S (ON)					30			30		pF
I^+	All Channels On or Off				16	40		16	40	µA
	V_{IN} = $V_{\overline{WR}}$ = 0V or 4.0V		●			60			60	µA

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range, otherwise specifications are at T_A = 25°C. V^+ = ±15V, V^- = –15V, GND = 0V, unless noted.

PARAMETER	CONDITIONS		LTC221M/LTC222M MIN	TYP	MAX	LTC221C/LTC222C MIN	TYP	MAX	UNITS
I^-				0.1	5		0.1	5	µA
		●			10			10	

AC ELECTRICAL CHARACTERISTICS

V^+ = 15V, V^- = –15V, GND = 0V, unless otherwise noted.

PARAMETER	CONDITIONS	LTC221M/LTC222M MIN	TYP	MAX	LTC221C/LTC222C MIN	TYP	MAX	UNITS
t_{ON}	V_S = 2V, R_L = 1kΩ, C_L = 35pF		290	400		290	400	ns
t_{OFF}			210	300		210	300	
t_{OPEN}		20	85		20	85		ns
Off Isolation	V_S = 2Vp-p, R_L = 1kΩ		75			75		dB
Crosstalk	f = 100kHz		90			90		
Charge Injection O_{INJ}	R_{GEN} = 0Ω, C_L = 1000pF, V_{GEN} = 0		5	±25		8	±25	pC
Total Harmonic Distortion THD	V_S = 2Vp-p, R_L = 10kΩ		0.01			0.01		%
t_{ON}, $\overline{WR}$	V_S = 2V, R_L = 1kΩ, C_L = 35pF		270	400		270	400	ns
t_{OFF}, $\overline{WR}$			160	300		160	300	

DIGITAL AND DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range, otherwise specifications are at T_A = 25°C. V^+ = 5V, V^- = GND = 0V, unless noted.

PARAMETER	CONDITIONS			LTC221M/LTC222M MIN	TYP	MAX	LTC221C/LTC222C MIN	TYP	MAX	UNITS
Analog Signal Range			●	0		5	0		5	V
R_{ON}	V_S = 1.5V, 3V	T_{MIN}				450			520	Ω
	I_D = 0.25mA	25°C			280	450		280	520	Ω
		T_{MAX}				650			650	Ω
Off Input Leakage I_S (OFF)	V_D = 4V, 1V; V_S = 1V, 4V				0.01	±1		0.01	±5	nA
	(Note 4)		●			±100			±100	nA
Off Output Leakage I_D (0FF)					0.01	±1		0.01	±5	nA
			●			±100			±100	nA
On Channel Leakage I_D (ON)	V_D = V_S = 1V, 4V				0.01	±1		0.01	±5	nA
	(Note 4)		●			±200			±200	nA
Input High Voltage V_{INH}, $V_{\overline{WRH}}$			●	2.4			2.4			V
Input Low Voltage V_{INL}, $V_{\overline{WRL}}$			●			0.8			0.8	V
Input High or Low Current I_{INH}, I_{INL}, $I_{\overline{WRH}}$, $I_{\overline{WRL}}$	V_{IN} = 5V, 0V $V_{\overline{WR}}$ = 5V, 0V		●			±1			±1	µA
C_S(OFF)					5			5		pF
C_D (OFF)					12			12		pF
C_D, C_S (ON)					30			30		pF
I^+	All Channels On or Off				8	20		8	20	µA
	V_{IN} = $V_{\overline{WR}}$ = 0V or 4.0V		●			30			30	µA

AC ELECTRICAL CHARACTERISTICS

V^+ = 5V, V^- = GND = 0V, unless otherwise noted.

PARAMETER	CONDITIONS	LTC221M/LTC222M MIN	TYP	MAX	LTC221C/LTC222C MIN	TYP	MAX	UNITS
t_{ON}	V_S = 2V, R_L = 1kΩ, C_L = 35pF		450	600		450	600	ns
t_{OFF}			190	300		190	300	ns
t_{OPEN}		100	250		100	250		ns
Off Isolation	V_S = $2V_{P-P}$, R_L = 1kΩ		75			75		dB
Crosstalk	f = 100kHz		90			90		dB
Charge Injection O_{INJ}	R_{GEN} = 0Ω, C_L = 1000pF, V_{GEN} = 2.5V		2			2		pC
Total Harmonic Distortion THD	V_S = $2V_{P-P}$, R_L = 10kΩ		0.01			0.01		%
t_{ON}, $\overline{WR}$	V_S = 2V, R_L = 1kΩ, C_L = 35pF		430	600		430	600	ns
t_{OFF}, $\overline{WR}$			160	300		160	300	ns

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

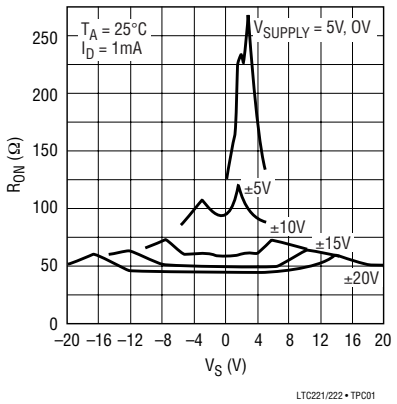
Note 2: Signals on S, D, or IN exceeding V^+ or V^- will be clamped by internal diodes. Limit forward diode current to maximum current rating.

Note 3: In-circuit ESD on the switch pins (S or D) exceeds 4kV (see test circuit).

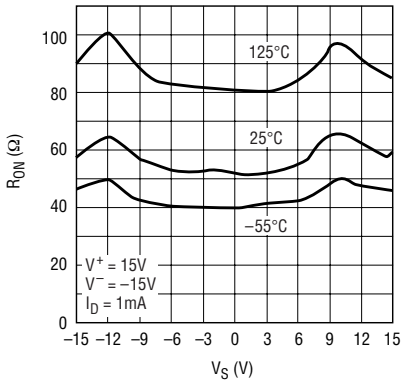
Note 4: Leakage current with a 5V supply is guaranteed by correlation with the ±15V leakage current.

TYPICAL PERFORMANCE CHARACTERISTICS

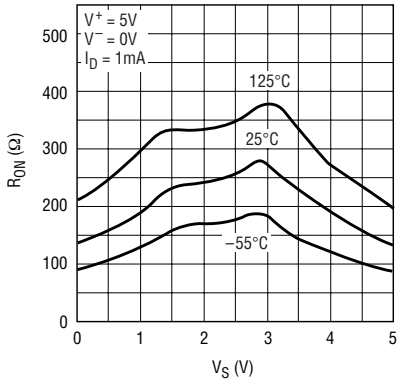
R_{ON} vs V_S Over Supply Voltage



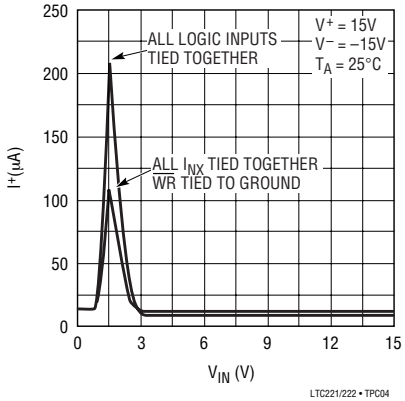
R_{ON} vs V_S Over Temperature



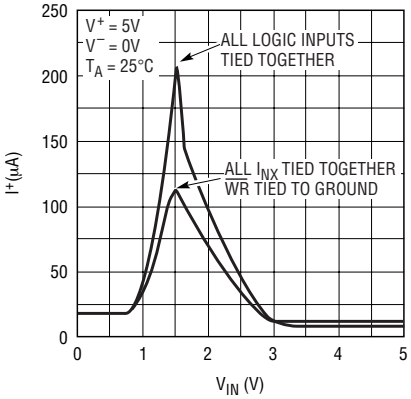
R_{ON} vs V_S Over Temperature



Positive Supply Current vs Logic Input Voltage



Positive Supply Current vs Logic Input Voltage

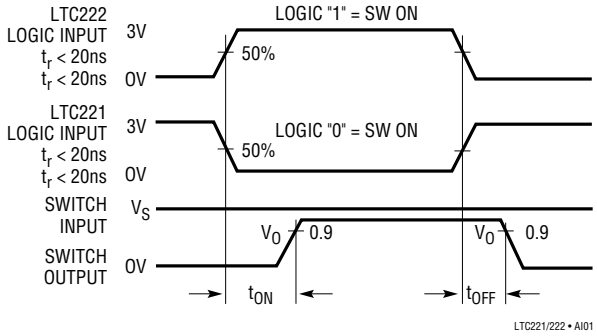


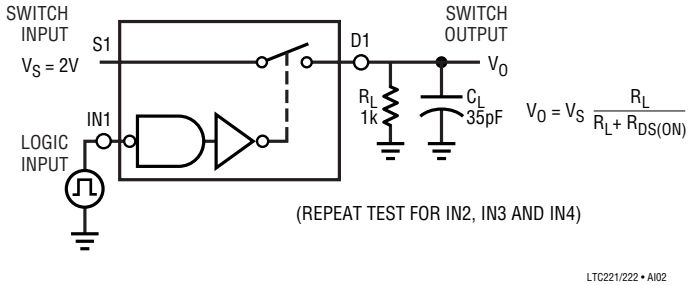
APPLICATIONS INFORMATION

Switching Time Test Circuit

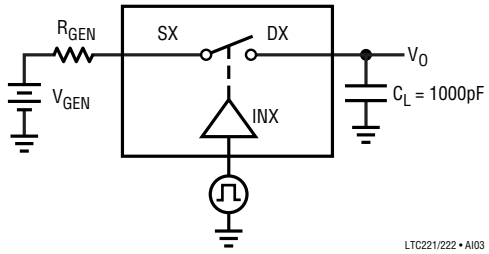
Switch output waveform shown for V_S = constant with logic input waveform as shown. Note that V_S may be (+) or (–) as per switching time test circuit. V_O is the steady state output switch on. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.

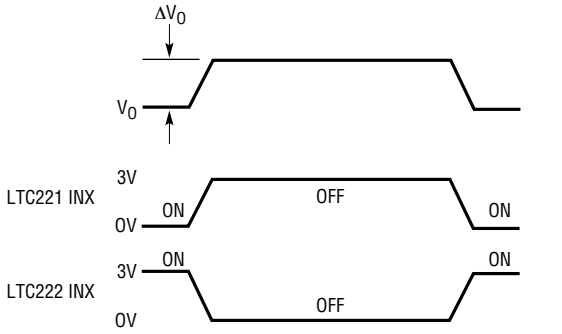
Switching Time Test Circuit





Charge Injection Test Circuit

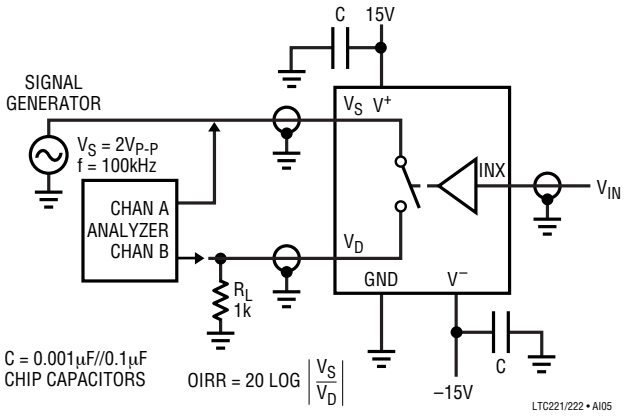




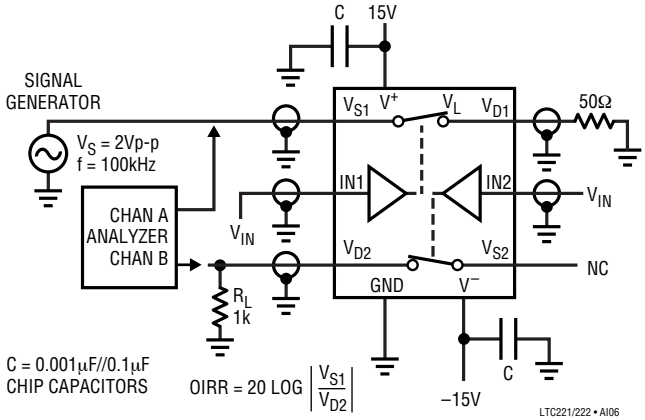
ΔV_O IS THE MEASURED VOLTAGE ERROR DUE TO CHARGE INJECTION. THE ERROR VOLTAGE IN COULOMBS IS $\Delta Q = V_L \bullet \Delta V_O$

LTC221/222 • AI04

OIRR-Off Isolation Test Circuit

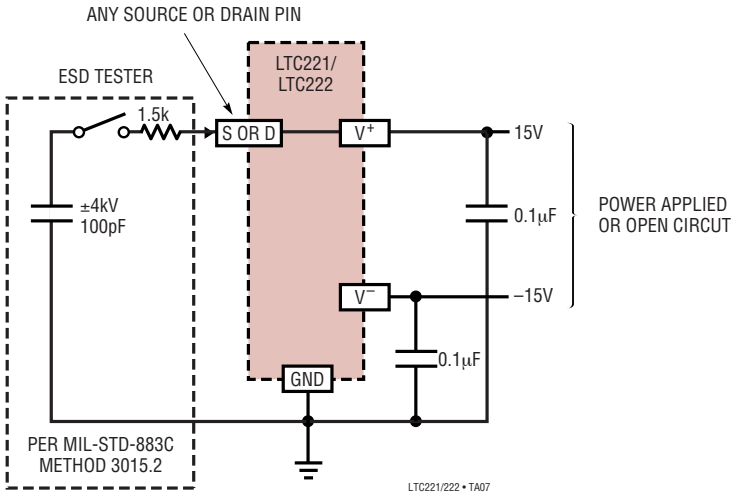


CCRR-Channel to Channel Crosstalk Test Circuit

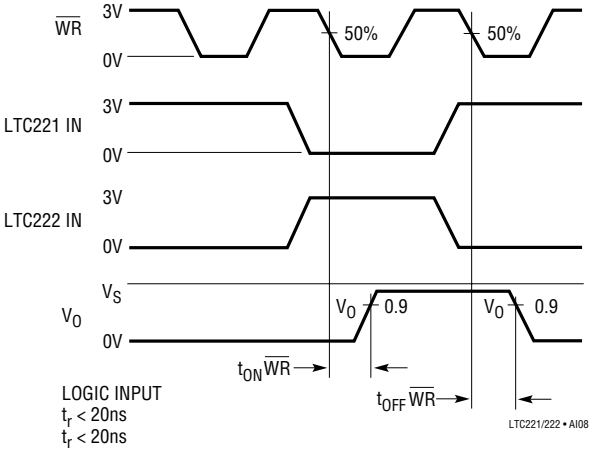


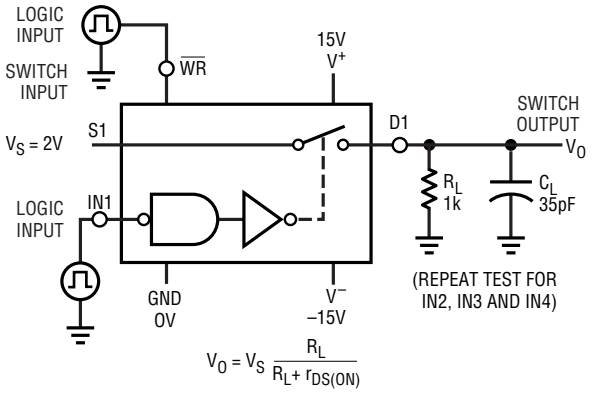
APPLICATIONS INFORMATION

In-Circuit ESD Test Circuit

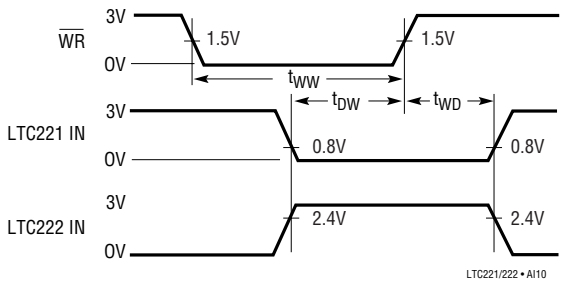


$\overline{WR}$ Switching Time Test Circuit





$\overline{WR}$ Setup Conditions

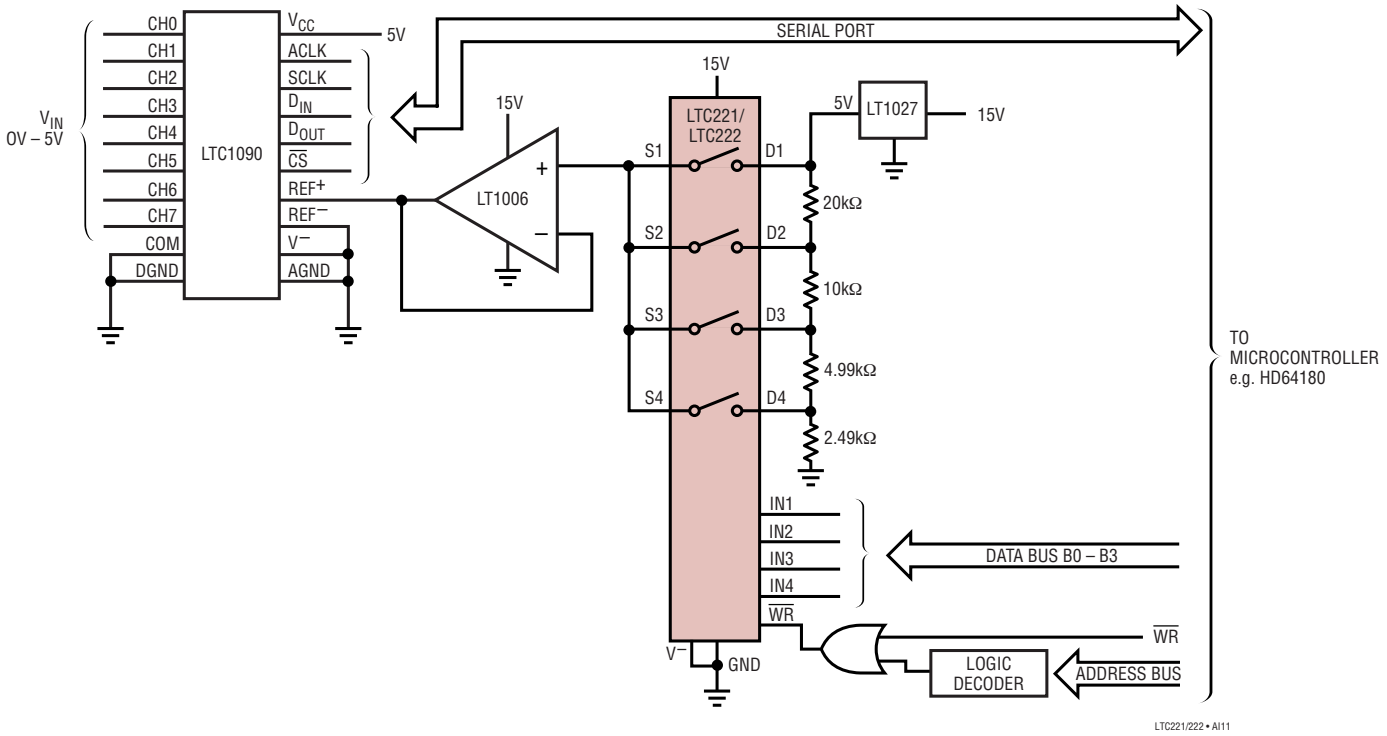


$\overline{WR}$/Input Minimum Timing Requirements

	PARAMETER	MIN LIMIT	UNITS
t_{WW}	Write Pulse Width	230	ns
t_{DW}	Data Valid to Write	180	ns
t_{WD}	Data Valid After Write	30	ns

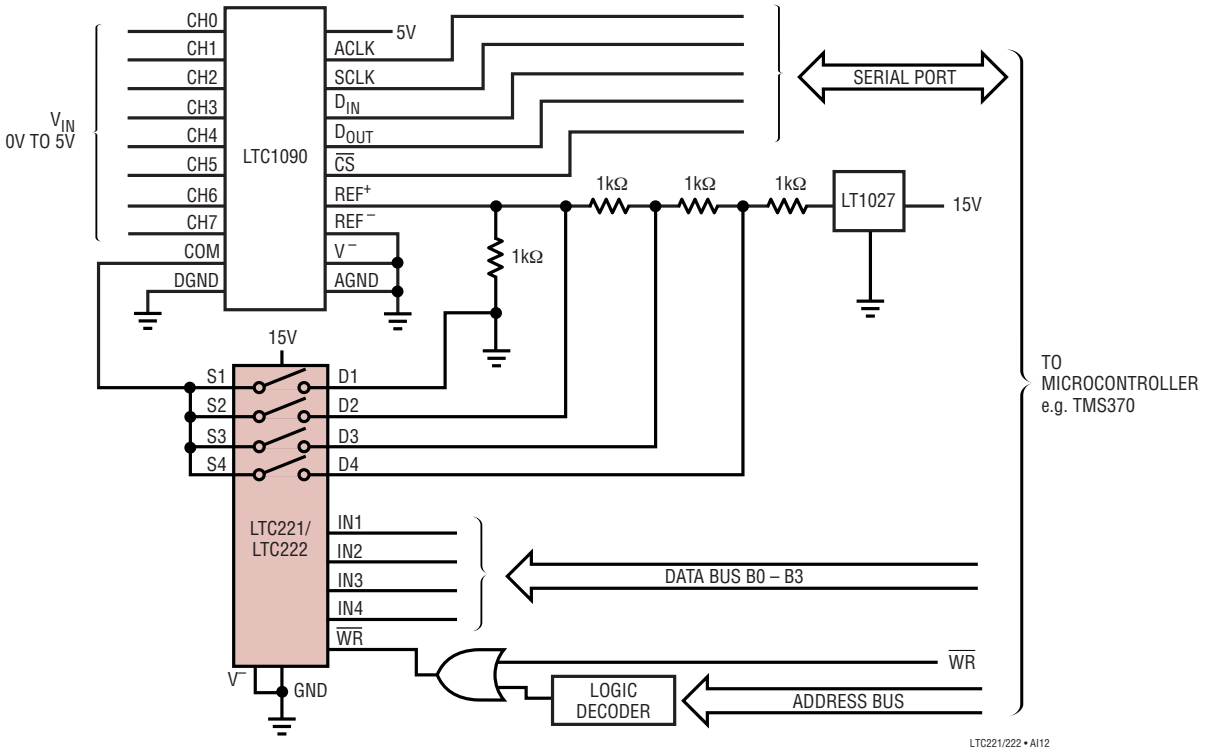
APPLICATIONS INFORMATION

Auto Ranging an 8-Channel, 10-Bit A/D Converter



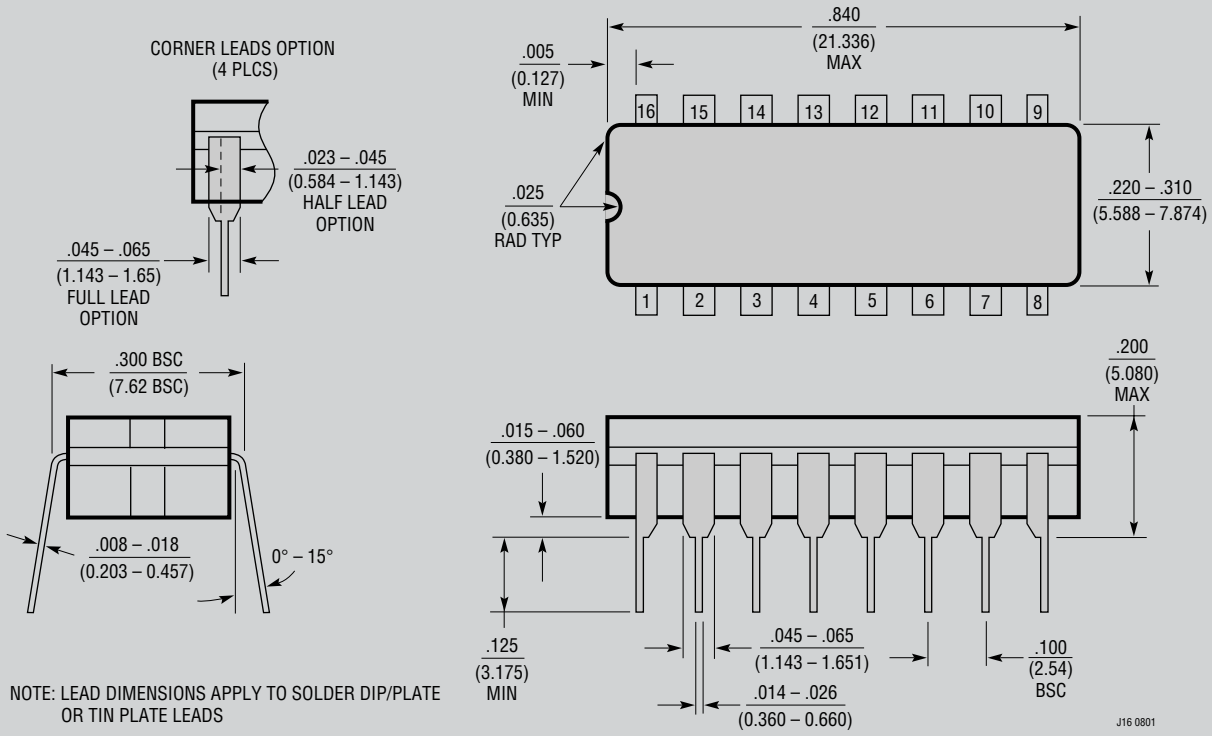
APPLICATIONS INFORMATION

8-Channel, 14-Bit A/D Converter



PACKAGE DESCRIPTION

J Package
16-Lead CERDIP (Narrow .300 Inch, Hermetic)
(Reference LTC DWG # 05-08-1110)

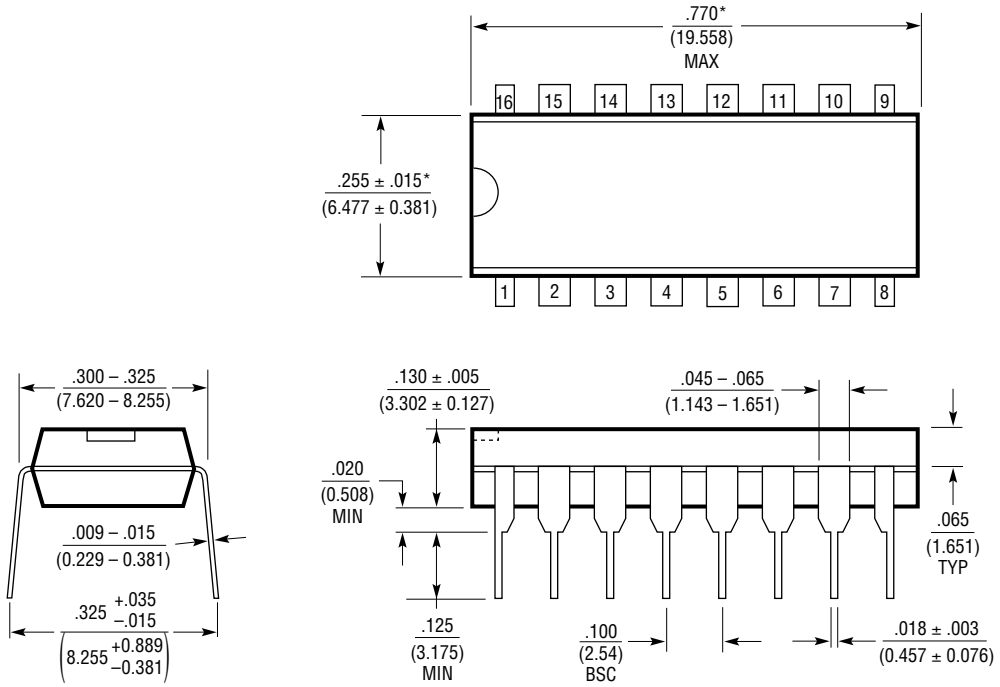


NOTE: LEAD DIMENSIONS APPLY TO SOLDER DIP/PLATE OR TIN PLATE LEADS

OBSOLETE PACKAGE

PACKAGE DESCRIPTION

N Package
16-Lead PDIP (Narrow .300 Inch)
(Reference LTC DWG # 05-08-1510)



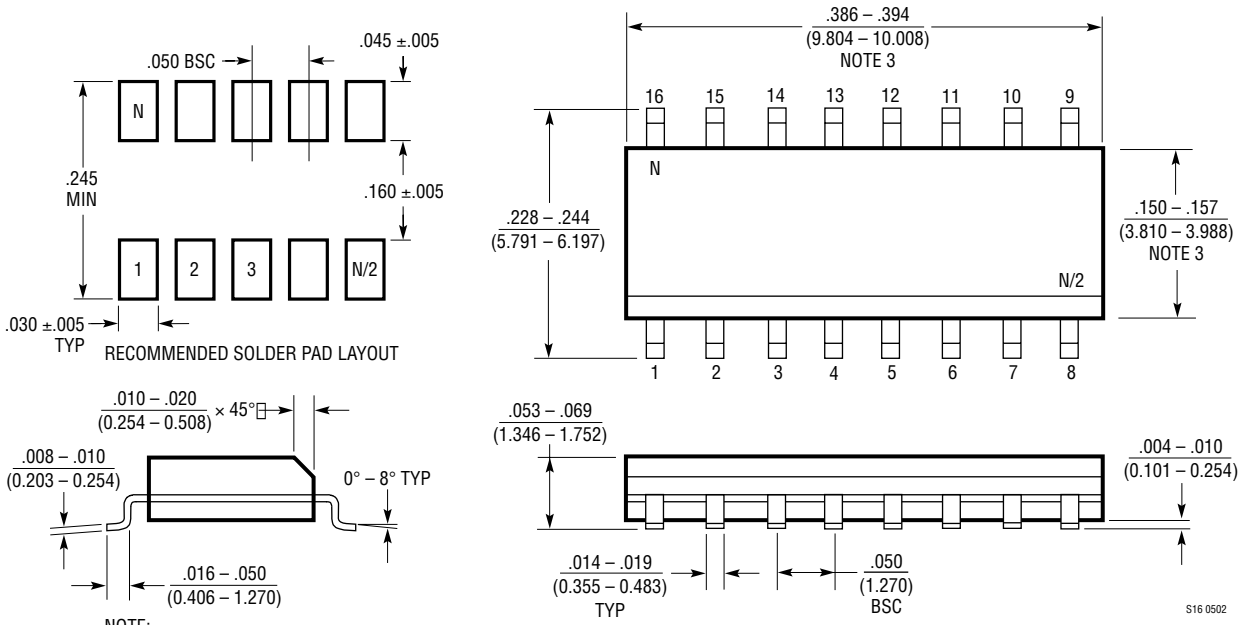
NOTE:
1. DIMENSIONS ARE INCHES / MILLIMETERS

*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

N16 0502

PACKAGE DESCRIPTION

S Package
16-Lead Plastic Small Outline (Narrow .150 Inch)
(Reference LTC DWG # 05-08-1610)



NOTE:
1. DIMENSIONS IN $\frac{\text{INCHES}}{(\text{MILLIMETERS})}$
2. DRAWING NOT TO SCALE
3. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
   MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .006" (0.15mm)

Information furnished by Linear Technology Corporation is believed to be accurate and reliable. However, no responsibility is assumed for its use. Linear Technology Corporation makes no representation that the interconnection of its circuits as described herein will not infringe on existing patent rights.

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC201/LTC202/LTC203	Micropower, Low Charge Injection, Quad CMOS Analog Switches	DG201/DG202 Compatible
LTC1380/LTC1393	8-Channel/4-Channel Analog Multiplexer with SMBus Interface	3V to ±15V, 8 Single Ended/4 Differential Inputs
LTC1390/LTC1391	8-Channel, Analog Multiplexer with Serial Interface	3V to ±15V Operation

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 • FAX: (408) 434-0507 • www.linear.com

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